University of Tehran
School of Electrical and Computer Engineering

Course:	**8101612 – Rapid prototyping in computing systems**
Course type:	EE*: Com ☐, E ☐, P ☐, B ☐, Con ☐, D ☐ — CE*: SW ☐, HW ☐, IT ☐ — Credit: 3 Required: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Elective: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☒ ☐
Level:	Undergraduate ■ Graduate ☐
Co-requisite(s):	None.
Prerequisite(s):	Computer Architecture (8101423) , Operating systems (8101443)
Prerequisite by topic:	Different architectures of computing systems. Digital design and C programming language
Textbook(s):	[1] James O. Hamblen, Tyson S. Hall, and Michael D. Furman, Rapid Prototyping of Digital Systems: QUARTUS II Edition, Springer, 2006. [2] Monica Bordegoni and Caterina Rizzi, Innovation in Product Design: From CAD to Virtual Prototyping, Springer, 2011.
Coordinator:	Salehi Nasab , Professor, School of ECE
Goals:	This course is designed to give students an understanding of techniques used in designing complex hardware/software systems based on new tools and methodologies in this domain. Students can also be familiar with managing engineering knowledge for modeling and simulating and different stages of designing a complex system such as description, design, implementation and test in real scenarios. This course contains theory and practical topics for a big hardware/software project in a number of teams.
Outcome:	Upon successful completion of the course, the students will gain a knowledge and understanding about 1. Designing a big system considering parameters. 2. Working and taking part in big teams 3. Identifying, formulating and solving engineering problems 4. Using modern engineering techniques and abilities 5. Being familiar with presenting a project proposal, technical report and product use case
Topics:	1) Evolution of digital tools for products 2) Introduction to Arduino 3) Foundations and implementation of sensors 4) Implementing an encoder motor 5) Simulating hardware in loop 6) System identification

	7) Generating system conversion function 8) System control 9) Setup operating system on processing board 10) Programming an application 11) Creating interface between computing board and control board 12) Setup and using camera 13) Image processing by OpenCV library
Computer usage:	C++ compiler and HDL
Assignments:	4 homework assignments
Projects:	6 Computer Assignments
Grading:	Assignments & quiz: 20 % Project: 40% Final exam: 40 %
Further readings:	[1] Ivan Radojevic and Zoran Salcic, Embedded Systems Design Based on Formal Models of Computation, Springer 2011. [2] Patrick R. Schaumont, A Practical Introduction to Hardware/ Software Codesign, Springer, 2010. [3] Daniel D. Gajski, Samar Abdi, Andreas Gerstlauer, and Gunar Schirner, Embedded System Design: Modeling, Synthesis and Verification, Springer, 2010. [4] Jingzhao ou and Viktor k. PraSanna, Energy Efficient Hardware-Software Co-Synthesis Using Reconfigurable Hardware, CRC Press, 2010. [5] Giovanni De Micheli, Rolf Ernst, and Wayne Hendrix Wolf, Readings in hardware/software co-design, Morgan Kaufmann, 2002. [6]
Prepared by:	Dr. Mostafa Salehi
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*EE: Electrical Engineering		CE: Computer Engineering	
Com	Communications	SW	Software
E	Electronics	HW	Hardware
P	Power	IT	Information Technology
B	Bioelectronics		
Con	Control		
D	Digital System		